

Kennecott Eagle Mine TWIS - Comparison of Groundwater Discharge Limits to Standards

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	Permit Limits						Drinking Water Criteria							Surface Water Criteria						
Column	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Substance	Expected Effluent Quality (Appx G-1)	Expected GW Discharge Quality (permit) ¹	Notification Level (5x Expected) ¹	Permit: Initial Effluent Limit ² (Max Daily / Avg. Monthly)	Permit: Final Effluent Limit ² (Max Daily / Avg. Monthly)	Permit: Downgradient GW ² (Max Daily)	MCL ³	Secondary MCL ⁴	MCLG ³	Lifetime Health Advisory (LHA) ⁴	Part 201 Op Memo 1 Res DW Criteria ⁵	Part 22 Groundwater Discharge ⁶	Violates Standard?	Final Chronic Value (FCV) at 50 mg/L Hardness	Part 201 Op Memo 1 GSI Criteria - 50 mg/L Hardness ⁵	Rule 57 Most Stringent Value - 50 mg/L Hardness ⁷	Final Chronic Value (FCV) at 30 mg/L Hardness	Part 201 Op Memo 1 GSI Criteria- 30 mg/L Hardness ⁵	Rule 57 Most Stringent Value - 30 mg/L Hardness ⁷	Violates Standard?
Aluminum	1.85	1.9	9.5	Report	Report	-	-	200	-	-	50	150	No	-	-	-	-	-	-	No
Antimony	0.97	1	5	Report	Report	5	6	-	6	6	6	3	Yes; Part 22 Yes; MCL, MCLG, Part 201, and Part 22	-	130 / 2**	1.7	-	130 / 2**	1.7	Yes; Part 201, Part 22, and Rule 57
Arsenic	1.66	-	-	10 / 6	10 / 6	6	10	-	0	-	10	5		-	150 / 50**	50	-	150 / 50**	50	No
Barium	1.37	1.4	7	Report	Report	1000	2000	-	2000	-	2000	1000	Yes; Part 22	210	210**	210	120	120**	120	Yes; FCV, Part 201, and Rule 57
Beryllium	0.05	0.05	0.25	Report	Report	3	4	-	4	-	4.0	2	Yes; Part 22	0.41	0.41**	0.41	0.11	0.11**	0.11	Yes; FCV, Part 201, and Rule 57
Boron	173.6	-	-	250 / -	285 / -	285	-	-	-	6000	500	250	Yes; Part 22	-	1900	1900	-	1900	1900	No
Cadmium	0.58	-	-	5 / 3	5 / 3	3	5	-	5	5	5.0	2.5	Yes; MCL, MCLG, LHA, Part 201, Part 22	1.3	1.3**	1.3	0.92	.92**	0.92	Yes; FCV, Part 201, and Rule 57
Calcium	25.53	-	-	-	-	Report	-	-	-	-	-	-	No	-	-	-	-	-	-	No
Chloride	44099.62	44000	220000	Report	Report	250000	-	250000	-	-	250000	250000	Yes; SMCL, Part 201, Part 22	-	- / 125000**	-	-	- / 125000**	-	Yes; Part 201
Chromium	0.49	0.5	2.5	Report	Report	52	100	-	100	-	100	50	Yes; Part 22	42	42/11**	42	28	28/11**	28	Yes; FCV, Part 201, and Rule 57
Cobalt	9.26	9.2	46	Report	Report	23	-	-	-	-	40	20	Yes; Part 201, Part 22	-	100	100	-	100	100	No
Copper	7.22	-	-	21 / 10	21 / 10	10	1300 ^{TT}	1000	1300	-	1000	500	No	5	5 **	5	3.2	3.2**	3.2	Yes; FCV, Part 201, and Rule 57
Fluoride	40.93	41	205	Report	Report	-	4000	2000	4000	-	-	1000	No	-	-	2700	-	-	2700	No
Iron	3.21	3.2	16	Report	Report	Report	-	300	-	-	300	300	No	-	-	-	-	-	-	No
Lead	0.49	0.5	2.5	Report	Report	3	15 ^{TT}	-	0	-	4.0	2	Yes; MCLG and Part 22	4.8	4.8**	4.8	2.7	2.7**	2.7	Yes; FCV, Part 201 and Rule 57
Lithium	4.19	4.2	21	Report	Report	88	-	-	-	-	170	85	Yes; Part 22	-	96	720	-	96	720	No
Magnesium	16.67	-	-	-	-	Report	-	-	-	-	400000	200000	No	-	-	-	-	-	-	No
Manganese	2.43	2.4	12	Report	Report	50	-	50	-	300	50	50	Yes; SMCL, Part 201 and Part 22	1000	1000 / 3600**	1000	670	670 / 3600**	670	No
Mercury	0.00205	-	-	Report / 0.0021	Report / 0.0021	Report	2	-	2	2	2.0	1	No	-	0.0013	0.0013	-	0.0013	0.0013	Yes; Part 201 and Rule 57
Molybdenum	1.07	1.1	5.5	Report	Report	22	-	-	-	40	73	18.5	Yes; Part 22	-	120 / 800 **	120	-	120 / 800 **	120	No
Nickel	4.86	4.9	24.5	Report	Report	57	-	-	-	100	100	50	Yes; Part 22	29	29**	29	29	29**	29	Yes; FCV, Part 201, and Rule 57
Ammonia (as N)	2327.94	2328	11640	Report	Report	10000	-	-	-	30000	10000	5000	Yes; Part 201 and Part 22	-	29**	29	-	29**	29	Yes; Part 201 and Rule 57

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Nitrate (as N)	30.12	30	150	Report	Report	10000	10000	-	10000	-	10000	5000	Yes; MCL, MCLG, Part 201, and Part 22	-	-	10000	-	-	10000	Yes; Rule 57
Phosphorus,total	0.78	0.8	4	Report	Report	Report	-	-	-	-	63000	1000	No	-	1000**	-	-	1000**	-	No
Potassium	1207.23	1200	6000	Report	Report	Report	-	-	-	-	-	-	No	-	-	-	-	-	-	No
Selenium	1.27	-	-	25 / 5	25 / 5	5	50	-	50	50	50	25	Yes; Part 22	5	5	5	5	5	5	Yes; FCV, Part 201, and Rule 57
Silver	0.2	-	-	17 / 0.4	17 / 0.4	0.4	-	100	-	100	34	17	Yes; Part 22	-	0.2 / 0.06 **	0.06	-	0.2 / 0.06 **	0.06	Yes; FCV, Part 201, and Rule 57
Sodium	30020.47	30000	150000	Report	Report	120000	-	-	-	-	120000	120000	Yes; Part 201 and Part 22	-	-	-	-	-	-	No
Strontium	94.61	95	475	Report	Report	2300	-	-	-	4000	4600	2300	Yes; Part 22	-	2300**	21000	-	2300**	21000	Yes; Part 201
Sulfate	1683.86	1700	8500	Report	Report	250000	-	250000	-	-	250000**	250000	Yes; SMCL, Part 201, Part 22	-	-	-	-	-	-	No
Thallium	0.39	0.4	2	Report	Report	1	2	-	0.5	-	2.0	1	Yes; MCL, MCLG, Part 201, Part 22	-	2.0 / 1.2**	1.2	-	2.0 / 1.2**	1.2	Yes; Part 201 and Rule 57
Vanadium	0.29	0.3	1.5	Report	Report	2.2	-	-	-	-	4.5	2	Yes; Part 22	-	12	12	-	12	12	No
Zinc	17.49	18	90	Report	Report	1200	-	5000	-	2000	2400	1200	Yes; Part 22	66	66**	66	43	43**	43	Yes; FCV, Part 201, and Rule 57

¹ Listed on p. 26, Attachment I of Groundwater Discharge Permit. For constituents with an "expected discharge quality" listed in the permit, detection of 5x that "expected" level in the effluent triggers a notification requirement and MDNRE may require additional measures to be taken. See Permit, p. 14, section 10(d).

² Kennecott must show it can meet the "initial" limits for at least 90 days before it is allowed to move to the "final" limits and begin to discharge. See Permit, p. 3, section 1 (initial effluent); p. 6, section 2 (final effluent); p.10, section 4 (downgradient groundwater).

³ Derived from EPA Table of National Primary Drinking Water Regulations, EPA-816-F-09-0004 (May 2009) [www.epa.gov/safewater/contaminants/index.html]. Note: Lead and copper are subject to Treatment Technique requirements. If more than 10% percent of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L (1300 ug/l), and for lead it is 0.015 mg/L (15 ug/l). Also note that although Michigan's Safe Drinking Water Act incorporated the MCLs by reference, only those in existence before 1977 were incorporated. See MCL 325.1006.

⁴As set forth in 2009 Edition of the Drinking Water Standards and Health Advisories, EPA 822-R-09-011 (October 2009).

⁵Residential drinking water criteria and groundwater surface water interface (GSI) criteria specified in Attachment 1, Table 1 to MDEQ RRD Op Memo #1 (rev 01/23/2006).

⁶As set forth in Kennecott's Groundwater Discharge Permit Application, Appendix G-1 (dated 12/06/05). Note that although ammonia and nitrate nitrogen are listed as having limits of 5000 ug/L each, per Rule 323.2222(2)(a) the standard for total inorganic nitrogen (including nitrate and ammonia) is 5000 ug/L combined. Standard for arsenic was changed to 5 ug/L to reflect the new lower Part 201 standard of 10 mg/L.

⁷Most stringent of criteria under Part 4 Water Quality Standards, Mich. Admin. Code Rule 323.1057. See Rule 57 Water Quality Values Table at < www.michigan.gov/deq/0,1607,7-135-3313_3686_3728-11382--,00.html >

** GSI standards for many substances are based on the lesser of FCV, wildlife value, or human non-drinking water value; other standards may also apply to discharges in close proximity to a water supply intake. See Op Memo 1 Attachment 1 Footnotes G, X. Where applicable, FCV values have been calculated using MDNRE's spreadsheet available online at http://www.michigan.gov/documents/deq/deq-rrd-opmemo18-G_271408_7.xls. Other calculations and/or exceptions apply to certain substances listed in this table. See Op Memo 1 Attachment 1 Footnotes E, H, M, CC, EE and FF. The chromium value of 11 ug/L is for chromium (IV).